

12/14/16 "What hurts more, the pain of hard work or the pain of regret?" -Unknown

HW: "Sketching Polynomials" #

Test 2 on Tuesday 12/20

AIM: How do we sketch polynomials without a graphing calculator?

Warm Up:

Given: $f(x) = x^6 - 5x^4 - 36x^2$

(a) The complete factorization

(b) The solution set

$$f(x) = x^2 (x^4 - 5x^2 - 36)$$

$$f(x) = x^2 (x^2 - 9)(x^2 + 4)$$

$$a) f(x) = x^2 (x-3)(x+3)(x^2+4)$$

$$f(x) = (x)(x)(x-3)(x+3)(x^2+4)$$

$$b) x = 0, 0, 3, -3, \pm 2i$$

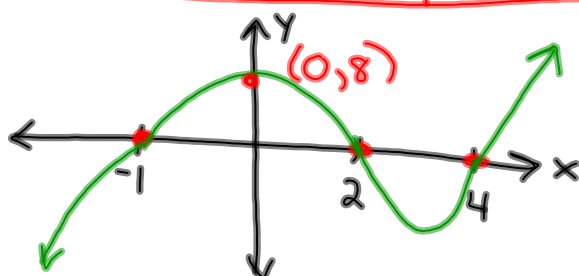
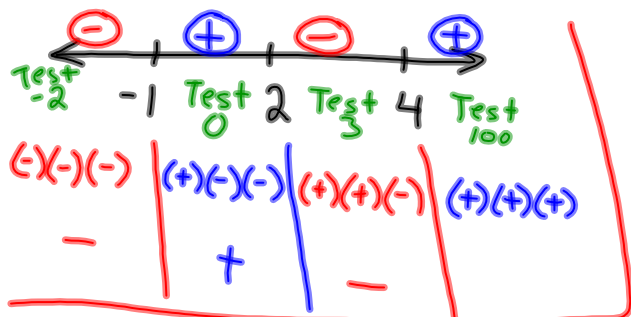
$$x = 0, 3, -3, \pm 2i$$

$$\begin{array}{r} x^2 + 4 = 0 \\ -4 - 4 \\ \hline x^2 = -4 \\ x = \pm \sqrt{-4} \\ x = \pm 2i \end{array}$$

Sketch the general graph of each function without your graphing calculator. Your sketch should contain both the x- and y-intercepts.

1. $f(x) = (x+1)(x-2)(x-4)$

$x = -1, 2, 4$



$y = (0+1)(0-2)(0-4)$

$y = (1)(-2)(-4)$

$y = 8 \leftarrow y\text{-intercept}$

x-intercepts: $(-1, 0) (2, 0) (4, 0)$

y-int: $(0, 8)$

STEP 1: Find the zeros

STEP 2: ENTER these values in order on a number line

STEP 3: Pick test values
Plug into the original function to see which are positive & negative
+ (above the x-axis)
- (below the x-axis)

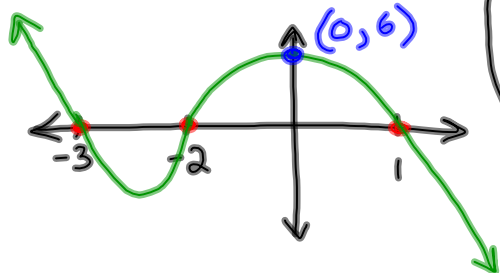
STEP 4 - Set up x & y axis. Put in the x-intercepts (zeros)

STEP 5 - Use the number line to help you sketch
(-) starts below x-axis
(+) starts above x-axis
Put in arrows at start & end of graph

(*) if you are asked to find the y-int, use the original equation: Plug in $x=0$ and solve for the y-value and graph

2. $f(x) = (x+3)(x+2)(x-1)$

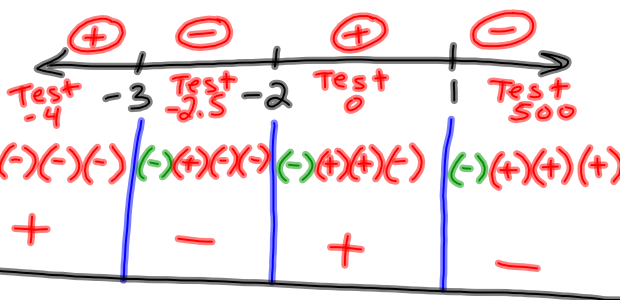
$x = -3, -2, 1$



$y = -(0+3)(0+2)(0-1)$

$= -(3)(2)(-1)$

$y = 6$



y-int: $(0, 6)$

x-int: $(-3, 0) (-2, 0) (1, 0)$

⑩ To find y-intercept
plug in 0 for x and solve

⑩ Factorization has parenthesis
Ex: $(x+2)(x-1)(x+3)$

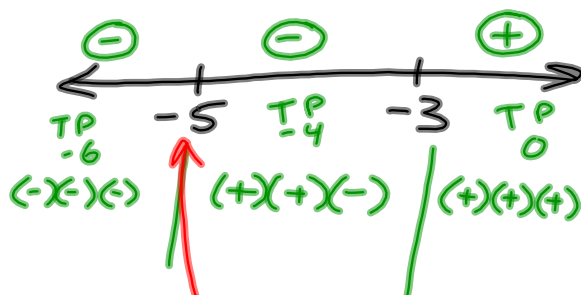
⑩ Zeros, roots, x-intercepts, solution set has $x = \dots$
Ex: $x = -2, 1, -3$

3. $f(x) = (x+5)^2(x+3)$

$f(x) = (x+5)(x+5)(x+3)$

$x = -5, -5, -3$

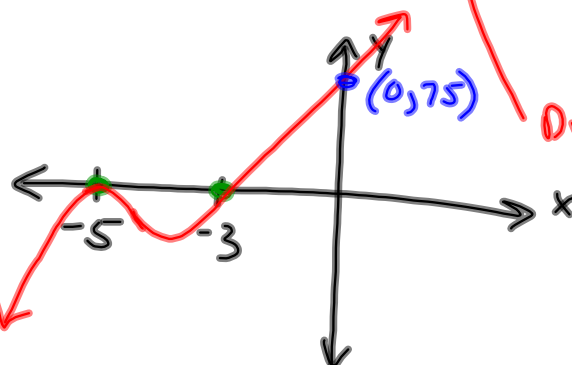
Multiplicity
of 2



$y = (0+5)^2(0+3)$

$y = 75$

y-intercept: $(0, 75)$



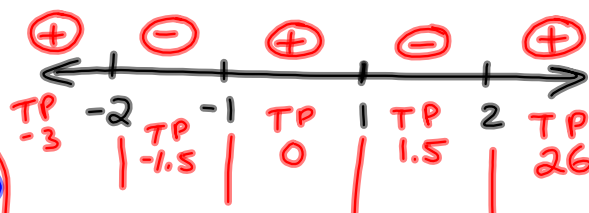
Didn't change
sign so it
looks like it
bounces off
x-axis

4. $f(x) = x^4 - 5x^2 + 4$

$f(x) = (x^2 - 1)(x^2 - 4)$

$f(x) = (x+1)(x-1)(x+2)(x-2)$

$x = -1, 1, -2, 2$

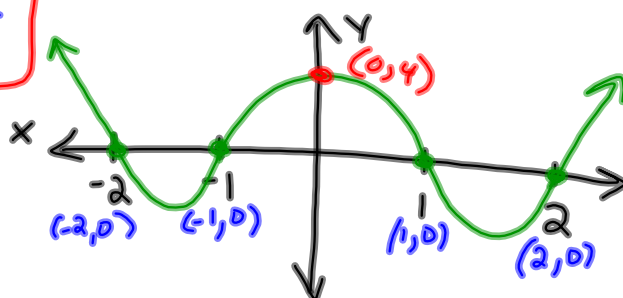


$y = 0^4 - 5(0)^2 + 4$

$y = 4$

y-int: $(0, 4)$

x-int: $(-2, 0), (-1, 0), (1, 0), (2, 0)$



$$(x+2)(x+2)(x+2)(x+2)$$

5. $f(x) = x^3 + 2x^2 - 8x$

6. $f(x) = x^3 + 2x^2 - 36x - 72$

$$f(x) = x^2(x+2) - 36(x+2)$$

$$f(x) = (x^2 - 36)(x+2)$$

$$f(x) = (x+6)(x-6)(x+2)$$

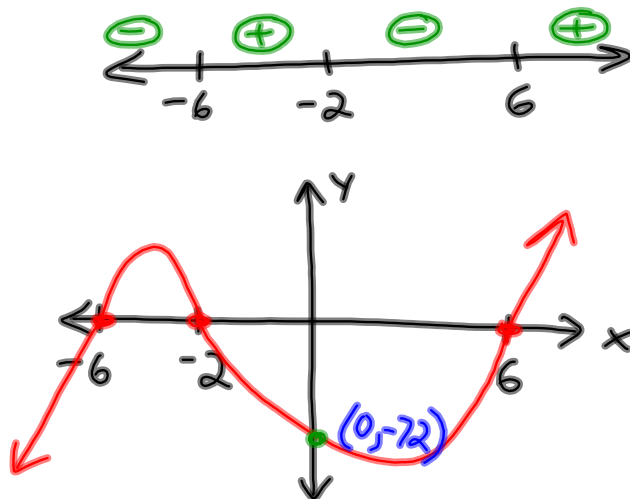
$$x = -6, 6, -2$$

$$\underline{x\text{-int:}} (-6, 0)(6, 0)(-2, 0)$$

$$y = 0^3 + 2(0)^2 - 36(0) - 72$$

$$y = -72$$

$$y\text{-int: } (0, -72)$$



$$11) f(x) = x^5 - 3x^4 - x^3 + 3x^2$$

$$f(x) = (x^2)(x^3 - 3x^2 - x + 3)$$

$$= (x^2)(x^2(x-3) - 1(x-3))$$

$$= (x^2)(x^2 - 1)(x-3)$$

$$= (x^2)(x+1)(x-1)(x-3)$$

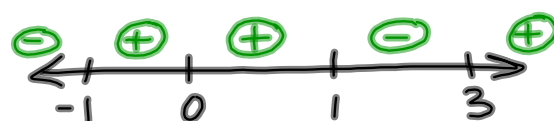
$$f(x) = (x)(x)(x+1)(x-1)(x-3)$$

$$x = 0, 0, -1, 1, 3$$

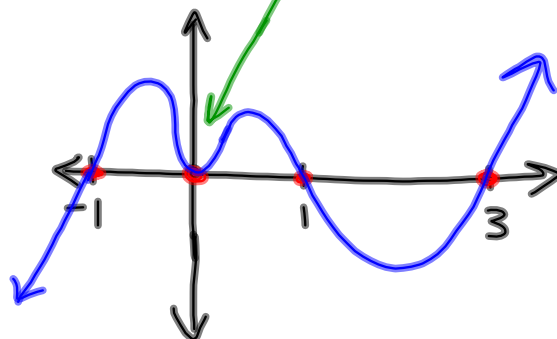
↑
multiplicity
of 2

y-int: (0,0)

x-int: (0,0) (-1,0) (1,0) (3,0)



↑
No change
b/c 0 appeared
an even # of times
(multiplicity of 2)



HW: Sketching w/s
7-10

- 1) Determine the equation of a quadratic function whose roots (zeros) are -3 and 4 which passes through the point $(2, -50)$.

factors are $(x+3)(x-4)$

